

Accordingly, elected claims 1-15 are presently subject to examination.

Applicants initially acknowledge the Patent Office's indication that claims 7-8 would be allowable if rewritten to overcome the rejection under 35 U.S.C. § 112, second paragraph, described below and to include all of the limitations of the base claim and any intervening claims (Action, page 8).

Applicants thank the Patent Office for the acknowledgement of allowable subject matter and have rewritten these claims as new claims 53 and 54, in accordance with the Office's helpful suggestions. Accordingly, these claims are believed to be in condition for immediate allowance.

In the Office Action, the Patent Office objects to the specification as not containing updated co-pending application information. Applicants have obviated this objection by providing application serial number information.

Applicants also have obviated the Patent Office's objection to claims 9 and 14 by amending these claims to address the formalities noted at page 3 of the Action.

Claims 1-9 stand rejected under 35 U.S.C. § 112, second paragraph. In particular, the Patent Office contends that claims 1-2 do not indicate what is included/excluded by the claims and that claim 3 lacks antecedent basis for "polymer gel mask." Lastly, the Patent Office objects to the word "substantially" in claim 5.

Applicants respectfully traverse the foregoing rejections. However, in the interest of advancing the prosecution of this application, claims 1-3 and 5 have been clarified. For example, claims 1-2 particularly recite a "patterning transfer element comprising a polymer gel for patterning biological materials" and a "contact mask comprising a polymer gel," respectively. Claim 3 has been amended to depend from claim 2 and the wording objected to by the Patent Office in claim 5 has been removed.

Moreover, Applicants respectfully point out that an aspect of Applicants' invention relates to patterning elements made of polymer gels. A contact mask is a type of

patterning element. *See* Applicants' specification at, *e.g.*, page 1, lines 1-5 and page 14. Accordingly, Applicants respectfully assert that the present claims particularly point out and distinctly claim the recited subject matter.

In view of the foregoing, reconsideration and withdrawal of the § 112 rejections is believed to be warranted and such favorable action is respectfully solicited.

Claim 1 stands rejected under 35 U.S.C. § 102(b) as anticipated by "Soft Lithography", *Angew. Chem., Int. Ed.*, 1998, vol. 37, 550-575 by Xia et al. (Xia). Similarly, claims 1-2 and 10-15 stand rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent 5,965,237 to Bruin et al. (Bruin). Applicants respectfully traverse these rejections and assert that neither reference discloses nor suggests the invention of claims 1-2 or 10-15 for at least the following reasons.

Xia, cited in Applicants' specification at page 2, describes the use of soft lithographic techniques, such as microcontact printing, for generating small structures. (*See* Page 551 of Xia). As described in Applicants' specification at page 2, Xia teaches the use of a PDMS pattern transfer element.

Bruin is directed to a microstructure device and teaches a microstructural element made of PDMS (Cols. 2-3 and 7). According to Bruin, casting of PDMS from microfabricated masters has recently found an increasing number of applications, *e.g.* microfabrication by micromolding in capillaries or by microcontact printing. (Col. 2, lines 16-20).

In contrast, Applicants' independent claims 1-2 and 10 specify a "patterning transfer element comprising a polymer gel for patterning biological materials," a "contact mask comprising a polymer gel" and a "contact mask comprising a polymer gel having at least one hole therethrough," respectfully.

As disclosed in Applicants' specification at page 7, lines 14-17, the patterning elements of the present invention are made from polymers that form gels when contacted with a liquid. A characteristic feature of gel-forming polymers is that they absorb the liquid but do

not dissolve in the liquid. Absorption of the liquid often causes a change in the polymer's elasticity, tensile strength and dimensions.

Applicants respectfully point out that the PDMS material disclosed in Xia and Bruin is not a polymer gel as set forth in the present claims.

To anticipate a claim, a single source must contain all of the elements of the claim. See *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379 (Fed. Cir. 1986). Xia or Bruin does not disclose each element of claims 1-2 or 10-15. Accordingly, neither of the references anticipates any of these claims.

Moreover, Applicants further respectfully assert that there is no motivation in either reference to modify their teachings in an attempt to arrive at Applicants' presently claimed invention, and the Patent Office has not pointed to any such motivation.

In view of the foregoing, Applicants respectfully assert that the afore-cited references neither disclose nor suggest Applicants' presently claimed invention. Withdrawal of the rejections based on Xia and Bruin is therefore believed to be warranted.

Claims 1-4, 10-11 and 14-15 stand rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent 5,961,479 to Reeves et al. (Reeves). Similarly, dependent claims 5-6 and 9 stand rejected under 35 U.S.C. § 103(a) as obvious over Reeves in view of U.S. Patent 3,220,960 to Wichterle et al. (Wichterle). Applicants respectfully traverse this rejection and assert that the subject matter of these claims is neither disclosed in nor suggested by the afore-cited references for at least the following reasons.

As described above, Applicants' independent claims 1-2 and 10 recite, respectively, a "patterning transfer element comprising a polymer gel for patterning biological materials," a "contact mask comprising a polymer gel" and a "contact mask comprising a polymer gel having at least one hole therethrough."

In contrast to Applicants' invention, Reeves is directed to a hydrogel therapeutic facial mask having a plurality of openings for the eyes, nose and mouth. This

therapeutic facial mask also includes straps and is applied to a patient's face to treat facial wounds. (Col. 1, line 64 to Col. 2, line 13; Figs.). Reeves is particularly concerned with providing a "suitable dressing which is capable of keeping a wound moist while absorbing excess wound exudates." (Col. 1, lines 47-50). The mask is merely placed on the wound such that it is "substantially non-traumatic to the wound upon removal." (Col. 1, lines 51-55). See Figs. 1-3 disclosing gaps at the eye, nose and mouth areas.

Reeves does not disclose nor suggest any type of patterning element, and Applicants respectfully assert that one skilled in the art seeking to develop Applicants' present claims, would not even be motivated to look to this reference, which relates to the art of treating facial wounds, for guidance. See, e.g., Col. 1, lines 4-55 of Reeves. Applicants' claimed invention is both functionally and structurally different than the therapeutic facial mask of Reeves. Moreover, there is no teaching or suggestion in Reeves that would motivate one of ordinary skill in the art to modify its teaching in an attempt to arrive at Applicants' presently claimed invention.

The addition of Wichterle does not cure the shortcomings of Reeves. That is, Wichterle merely relates to cross-linked hydrophilic polymers and articles such as contact lens and implants made therefrom. (Col. 1, lines 1-45).

It is well established that "there must be some reason for the combination other than the hindsight gleaned from the invention itself." *Uniroyal v. Rudkin-Wiley*, 5 U.S.P.Q. 2d 1434, 1438 (Fed. Cir. 1988). There must be some prior art teaching that would have provided the necessary incentive or motivation for modifying the primary reference in the manner suggested by the Examiner. *In re Laskowski*, 10 U.S.P.Q. 2d 1397, 1399 (Fed. Cir. 1989). As stated by the Federal Circuit in *In re Fritch*:

The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggest the desirability of the modification.

23 U.S.P.Q. 2d 1780, 1783-1784 (Fed. Cir. 1992).

The references relied upon by the Patent Office fail to provide the necessary

invention or motivation for combining and then modifying the references in a manner that would produce the invention as presently claimed and it is asserted that a *prima facie* case of obviousness cannot be established by picking and choosing from isolated disclosures of references. Accordingly, the rejection should be reconsidered and withdrawn.

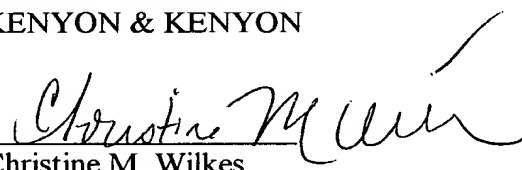
Also, in accordance with 37 C.F.R. § 1.121, attached hereto is a marked-up version of the changes made by the present amendment. The attached pages are captioned "Version with Markings to Show Changes Made."

For the preceding reasons, it is respectfully submitted that the application is in condition for immediate allowance. A Notice of Allowance is therefore respectfully requested.

The Examiner is invited to telephone the undersigned at the telephone number listed below should the Examiner have any questions or believe that a discussion would advance the prosecution of this application.

Respectfully submitted,  
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Dated: October 1, 2002

  
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**Version with Markings to Show Changes Made**

**In the Specification:**

Paragraph at Page 3, line 1 to Page 4, line 9 in the Background of the Invention section:

The handling of minute quantities of chemicals and biological materials as required for high throughput screening of drug candidates is a challenge currently facing the pharmaceutical industry. For instance, the lack of suitable liquid handling devices has been cited as a stumbling block to further screen miniaturization. Stylli, H; "An Integrated Approach to High Throughput Screening" in *Handbook for the 1994 International Forum on Advances in Screening technologies and Data Management* at p. 5. Methods have been developed to position such minute quantities in a small area using robotic equipment and ink jet delivery devices. Commonly-assigned co-pending Patent Application Serial No. 09/709,776 [Applications Serial Nos. [atty. docket 11641/5 and 4] disclose] discloses alternative methods of positioning minute quantities of material in a small area on a biological array that are compatible with and complimentary to robotic methods. One such method involves placing a contact mask over a substrate to conceal a portion of the substrate and leave a plurality of discontinuous portions of the substrate exposed. Such a mask has a plurality of holes through it. Each of the holes, together with the portion of the substrate surface which it overlies, forms a cavity. Biological and chemical materials can be deposited into each of the cavities individually using robotic equipment, or collectively by immersion in a solution, spraying, brushing or dropwise deposition using far less sophisticated and expensive equipment than is conventionally used to address individual elements of an array. PDMS has desirable adhesion, elasticity and strength properties and can be cast from a non-viscous precursor so that minute features like 50  $\mu\text{m}$  holes are transferred from a mold master to the PDMS. PDMS, however, is cytophilic, which is problematic for patterning cells, proteins and other biological materials in an array because these materials tend to adsorb onto the PDMS. In many applications for which bioarrays are suited, it is necessary to deposit material over the entire array or into a large group of adjacent cavities. Depositing material over large contiguous portion of an array has potential cost savings in fabricating and using

the array because these steps can be conducted without expensive and time consuming robotic manipulations. However, when large areas of the array are addressed collectively, it is detrimental to the process if the material adheres to the top surface of the contact mask instead of depositing into a cavity. In addition, material adsorbed by the PDMS in one patterning step may interfere or react with material being patterned in a subsequent step. The present invention provides a solution to this problem by providing a non-cytophilic patterning element, such as a contact mask, that has the desired properties of adhesion and elasticity (akin to those of PDMS) and acceptable tensile strength for use in patterning of biological and chemical materials on microarrays.

Paragraph at Page 13, line 18 to page 14, line 3 in the Detailed Description section:

Patterning elements that may be made from hydrogels using the molding technique and apparatus described below include stamps, such as the PDMS stamps described in U.S. Patents Nos. 5,776,748; 5,512,131 and 5,900,160 and contact masks such as are described in commonly assigned, co-pending U.S. Patent Application Serial No. 09/709,776 [Applications Serial Nos. [atty. docket Nos. 1164/4, 11641/5]]. Hydrogels that exhibit faithful elastic memory are well suited to both applications. For instance, a hydrogel stamp is a good patterning element for patterning aqueous solutions of biological materials onto a substrate. The hydrogels are especially well suited for use as contact masks in the patterning of biological materials upon a substrate and the invention will now be further described with reference to such patterning elements, their production and use.

Paragraph at page 14, line 19 to page 15, line 2 in the Detailed Description section:

Holes or cavities in the contact mask or diffusion mask, respectively, may have any desired shape. Holes and cavities preferably have a cross-sectional area of approximately 1  $\mu\text{m}^2$  to several  $\text{mm}^2$ . In masking techniques disclosed in commonly owned co-pending U.S. Application Serial No. 09/706,776 [[atty. docket No. 11641/4]], multiple masks are used to pattern multiple biological and chemical materials. In such techniques, the size and shapes of the holes may vary from one mask to another and holes of various sizes and shapes may be present on the same mask.

**In the Claims:**

Please amend claims 1-3, 5, 9, 14 and 15, and add new claims 53-66 as follows:

1. (Amended) A patterning transfer element comprising a polymer gel [patterning element] for patterning biological materials.
2. (Amended) A [polymer gel] contact mask comprising a polymer gel.
3. (Amended) The polymer gel contact mask of claim 2 wherein the polymer gel is a hydrogel.
5. (Amended) The polymer gel contact mask of claim 4 wherein the polymer chains are [substantially] a homopolymer of HEMA crosslinked with a crosslinking agent.
9. (Amended) The polymer gel contact mask of claim 3 wherein the hydrogel is formed by polymerization of a polymer precursor composition comprising one or more chemically distinct monomer compounds and a crosslinking agent wherein the crosslinking agent is present in an amount of about 1 mole percent to about 5 mole percent with respect to the total monomer compound content.
14. (Amended) The contact mask of claim 10 wherein the polymer gel is selected from the group consisting of [poly(dimethylsiloxanes); poly(organosiloxane)]; polyphosphazenes; [polyurethanes;] polyacrylates; polymethacrylates, poly(ethylene glycol), poly(ethylene glycol) acrylates, poly (vinyl alcohol), [PEG-methacrylates] polyethylene glycol methacrylates, 2-(trimethoxysilyloxy)ethyl methacrylate, trimethoxysilyloxy alkyl methacrylate, trimethoxy silyl alkyl methacrylate, polyvinylpyrrolidinone and carbohydrate-based hydrogel polymers, heparin, heparin sulfate, hyaluronic acid, polylactic acid, polybutadienes, hydrogels, and combinations thereof.
15. (Amended) [A] The polymer gel contact mask of claim 10 formed by complementary molding.
53. (New) A hydrogel contact mask wherein the hydrogel comprises polymer chains



of polyHEMA and the polymer chains are co-polymers of HEMA, a hydrophobic monomer and, optionally, a crosslinking agent.

54. (New) A hydrogel contact mask wherein the hydrogel comprises polymer chains of polyHEMA and the polymer chains are block co-polymers of HEMA and a biodegradable polymer.

55. (New) The polymer gel contact mask of claim 2 wherein the polymer gel is a hydrogel or polyelectrolyte gel.

56. (New) A patterning transfer element comprising a polymer gel for patterning biological materials, wherein the polymer gel comprises a HEMA copolymer.

57. (New) A polymer gel contact mask, wherein the polymer gel comprises a HEMA copolymer.

58. (New) The contact mask of claim 57 comprising at least one hole therethrough.

59. (New) The contact mask of claim 2 wherein the mask is located on an inanimate substrate.

60. (New) The patterning transfer element of claim 1 wherein the patterning transfer element is a stamp.

61. (New) The patterning transfer element of claim 1 wherein the patterning transfer element is applied to an inanimate substrate.

62. (New) The patterning transfer element of claim 1 wherein the patterning transfer element conforms to a surface of a substrate upon contact with the surface.

63. (New) The contact mask of claim 2 wherein the mask is in conformal contact with a surface upon which the mask is located to provide a seal between the mask and the surface.

64. (New) The contact mask of claim 10 wherein the mask is in conformal contact with a surface upon which the mask is located to provide a seal between the mask and the

surface.

65. (New) The contact mask of claim 63 wherein the surface is the surface of a culture dish for culturing cells.

66. (New) The contact mask of claim 64 wherein the surface is the surface of a culture dish for culturing cells.